Measurement News

November 2000 Issue #104

Photo of measurement team - Ishmael Khozi (ASA Technical Director), Mehlo Hlabangane (Soweto Marathon co-ordinator) Joe Morris (Central Gauteng Administrator) and Norrie Williamson who were joined by one of the local lady veteran runners out on a training run over the route, while they measured. They are outside the Morris Isac school in Soweto, where the 1976 uprising of school children took place. This was a major occasion in the fight against apartheid, when school children protested over a law that forced education to be given in Afrikaans.

MEASUREMENT NEWS

#104 - November 2000

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CHAIRMAN'S CLATTER - *OCTOBER 2000*

Calibration Constants
Recently it became apparent that not all certifiers were aware of the option of using the average calibration to determine course length. Average calibration is an acceptable method of calculating a course. It is not the recommended method but certainly allowable. Some of our esteemed colleagues feel that average calibration should be an available option to anyone wishing to use it at any time for any reason. Other equally esteemed colleagues believe that use of the average calibration risks courses coming up short on validation. More discussion seems in order on this before a clear resolution can be determined. To date the discussion has been confined to a small group. Here is your chance to be heard. Send your comments to *MNForum*, *Measurement News* (Pete Riegel) or to Mike Wickiser.

Another issue that came to light is the one of a certifier's authority and responsibilities. Each state certifier and final signatory has the authority to bend the rules whenever it is appropriate. The course measurement manual *Course Measurement Procedures* cannot cover every possible measurement scenario. The manual doesn't say anything about 500 foot steel cables or a single-person layout of a calibration course, yet both happen all the time and are perfectly acceptable if done right. My point is this: If a measurer comes up with a method that isn't covered, give it some thought. If you aren't comfortable with something, both Tom McBrayer and Paul Hronjak can help with questions or concerns, and I am always willing to help out.

The USATF Convention in Albuquerque, NM is coming up in late November. Don Shepan, New Mexico Certifier, has agreed to handle the measurement contest.

Agenda topics are solicited. There will be discussion on course renewals and average versus larger calibration constant so far. Now is the time to voice measurement topics or concerns so they can be included at the convention.

RRTC meetings are scheduled for Friday, December 1, from 4:00 to 6:30 PM and Saturday, December 2, from 3:00 to 6:00 PM.

NEWS FROM SOUTH AFRICA

Attached the results of the measurement to the 42kms mark - with the final 195 being marked out onto the finishing field on the day prior to the race.

The race this year will expect about 4000 entries - with money made going to the trust - it fosters the progress of sport in the townships and between cultures.

I think I have said to you before that my first measurement in Soweto in 1993 (as a lone white guy on a bicycle with no obvious 'protection) was absolutely unbelievable. It was one of the most enjoyable that I have ever done. I find it hard to describe. People come out and welcome me, cars and taxi's (normally flying oblivious of cyclists in urban areas) slow to pass precariously past you and shout welcome or wave. This year we saw many runners out on the road training for the race.

It was great having Ishmael and Joe there as it was the 3 of us who did the original measurement in 1993, (when no-one knew about the marathon or measurement and even the first democratic elections were still to take place), now 7 years later the welcome is as good if not better. --- It is a pity so many people have the wrong perception of Soweto --

The course evolved over the past 7 years - We laid it out in 1993 for the first time. There were some changes in 1994 and John Disley measured it again with minor changes in 1996 - this has been then latest official measurement. However, Joe Morris and Ishmael Khozi have been diligent in keeping the marks in condition. The calibration distance (right by the start and finish) is the same one laid out by John as part of a seminar in 1996.

I sent some info to Hugh with regards to the next IAAF/AIMS meeting and upgrading and hope that by early in the 2001 we will be in a position to go through the formalities to request / propose some measurers for IAAF ranking - I think Joe (and his son Adrian) will be amongst those. However we have a few 'procedural' hurdles with ASA to go through before that happens. (Hence one reason for ensuring the ASA reps were with me on the Soweto ride - and it seems to have paid dividends as the seminar is now something they are going to push for.) Hugh has sent a copy of my reply and a more detailed report on the position to John Disley as IAAF area rep - I am sure they will fill you in with the detail at your meeting. There may be an update on this after this coming weekend when the ASA road commission have a meeting (and I hope we get a fixed date for a grading seminar) One thing is clear - It would cause adverse reactions if someone is upgraded without a standard appraisal as too many people would construe it as being favouring a particular person or type of person - so it needs to be done in an open forum - Hence the seminar option.

Regards
Norrie Williamson

SOWETO MARATHON 5 NOVEMBER 2000 - MEASURED 7 OCTOBER 2000

Measured by Norrie Williamson

STARTING READING: 859554

Km mark	description	Actual reading	Distance Kilometers	Theory Reading	Difference (in clicks)	Distance to move KM (in metres)
0	Start	859554	0.0000	859554	0.0	0.0
1		870907	0.9997	870910	3.0	0.3
2		882252	1.9988	882265.9	13.9	1.2
3		893601	2.9982	893621.9	20.9	1.8
4		904948	3.9974	904977.9	29.9	2.6
5		916271	4.9945	916333.8	62.8	5.5
6		927612	5.9931	927689.8	77.8	6.9
7		938967	6.9931	939045.8	78.8	6.9
8		950322	7.9930	950401.8	79.8	7.0
9		961684	8.9935	961757.7	73.7	6.5
10		973034	9.9930	973113.7	79.7	7.0
11		984397	10.9936	984469.7	72.7	6.4
12		995735	11.9920	995825.6	90.6	8.0
13		1007090	12.9919	1007182	91.6	8.1
14		1018435	13.9910	1018538	102.6	9.0
15		1029762	14.9884	1029894	131.5	11.6
16		1041104	15.9872	1041250	145.5	12.8
17		1052461	16.9873	1052605	144.5	12.7
18		1063917	17.9961	1063961	44.5	3.9
19		1075304	18.9988	1075317	13.4	1.2
20		1086629	19.9961	1086673	44.4	3.9
21		1097956	20.9935	1098029	73.4	6.5
21.0975		1099086	21.0930	1099137	50.6	4.5
22		1109399	22.0012	1109385	-13.7	-1.2
23		1120665	22.9933	1120741	76.3	6.7
24		1132033	23.9943	1132097	64.3	5.7
25		1143450	24.9997	1143453	3.2	0.3
26		1154727	25.9928	1154809	82.2	7.2
27		1166090	26.9934	1166165	75.2	6.6
28		1177443	27.9931	1177521	78.1	6.9
29		1188795	28.9928	1188877	82.1	7.2
30		1200160	29.9936	1200233	73.1	6.4
31		1211523	30.9942	1211589	66.1	5.8
32		1222893	31.9954	1222945	52.0	4.6
33		1234269	32.9972	1234301	32.0	2.8
34		1245626	33.9973	1245657	31.0	2.7
35		1256994	34.9983	1257013	18.9	1.7
36		1268328	35.9964	1268369	40.9	3.6
37		1279670	36.9952	1279725	54.9	4.8
38		1291034	37.9959	1291081	46.8	4.1
39		1302415	38.9981	1302437	21.8	1.9
40		1313800	40.0006	1313793	-7.2	-0.6
41		1325138	40.9991	1325149	10.8	0.9
42		1336509	42.0004	1336505	-4.3	-0.4
42.195	Finish on Field		42.1950	1338719		194.6

-ve means move Km mark back towards start --- +ve means add distance to Km mark

	START	FINISH	CLICKS
PRE - CALIBRATION			
1st RIDE	817667	823337	5670
2nd RIDE	823337	829005	5668
3rd RIDE	829005	834675.5	5670.5
4th Ride	840344	846015	5671
TOTAL			22679.5
AVERAGE			5669.875
POST CALIBRATION	START	FINISH	CLICKS
1ST RIDE	341190	346862.5	5672.5
2ND RIDE	346862.5	352539	5676.5
3RD RIDE	352539	358213	5674
4TH RIDE	358213	363889	5676
TOTAL			22699
AVERAGE			5674.75
AVERAGE OF AVERAGES			5672.313
CALIBRATION DISTANCE			500
PER KM WITHOUT SCPF			11344.63
WITH SCPF			11355.97
HENCE CONSTANT FOR DAY			**11355.97**

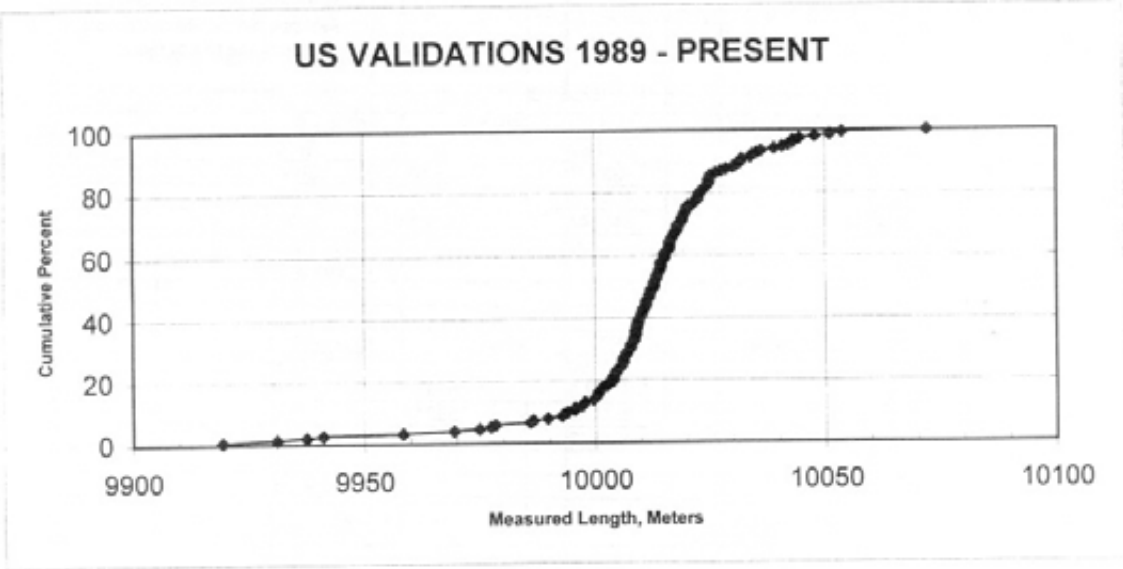
VALIDATION RESULTS - 1989 COURSES TO PRESENT

The RRTC validation program has been in effect for about two decades. The first course for which we have record of a validation was measured in 1980. Since then 339 courses have undergone validation.

Results of all out validations are kept in a file called "val.xls." This file is available to anyone who wants to look at it or use it for research. Contact Pete Riegel if interested. Results have been presented in earlier articles using "m/km" terms, which are confusing to some. Below may be seen the results of all validations done on courses measured in the last ten years, presented as if each course validated was a 10 km course.

9919.4	9995.7	10004.1	10008.1	10010.5	10013.5	10016.4	10019.9	10025.0	10040.9
9919.4	9997.2	10004.5	10008.5	10010.5	10013.5	10016.4	10020.1	10025.4	10042.3
9919.4	9997.5	10004.7	10008.6	10011.0	10013.8	10016.5	10020.1	10025.4	10043.2
9941.1	9997.8	10005.0	10008.7	10011.1	10014.0	10016.8	10020.4	10026.5	10043.3
9958.4	9999.7	10005.6	10008.9	10011.2	10014.1	10017.0	10021.5	10027.7	10044.7
9969.5	10000.1	10005.8	10008.9	10011.3	10014.4	10017.4	10021.8	10028.8	10048.0
9975.0	10000.5	10006.2	10008.9	10011.8	10014.4	10017.4	10022.6	10030.2	10051.2
9977.4	10000.7	10006.2	10009.1	10011.8	10014.5	10017.9	10022.6	10031.0	10053.8
9978.4	10000.8	10006.2	10009.2	10012.0	10014.5	10018.1	10022.8	10031.8	10072.1
9985.9	10001.2	10006.3	10009.3	10012.2	10015.2	10018.1	10023.0	10032.0	
9986.6	10001.6	10006.8	10009.4	10012.2	10015.3	10018.2	10023.2	10032.2	
9989.8	10002.7	10006.9	10009.5	10012.8	10015.3	10019.0	10023.8	10034.1	
9992.8	10002.8	10007.2	10009.7	10012.9	10015.3	10019.1	10024.3	10034.4	
9993.2	10003.9	10007.7	10010.0	10012.9	10015.7	10019.1	10024.8	10035.4	
9994.1	10004.1	10007.8	10010.2	10013.0	10016.3	10019.4	10025.0	10036.4	
9995.6	10004.1	10007.8	10010.4	10013.3	10016.3	10019.6	10025.0	10039.2	

Number validated 1989 - present	153	Courses between 10000 & 10020	92
		Percent between 10000 & 10020	60.1
Median measurement, meters	10012.9		
Average measurement, meters	10011.5	Courses between 9995 & 10025	114
Standard deviation, meters	20.9	Percent between 9995 & 10025	74.5
Number less than 9995 meters	15	Courses between 9990 & 10030	122
Percent less than 9995 meters	9.8	Percent between 9990 & 10030	79.7
Number less than 10000 meters	21	Courses between 9980 & 10040	135
Percent less than 10000 meters	13.7	Percent between 9980 & 10040	88.2



COMMENTARY ON VALIDATION RESULTS

We seem to have a lot more variation in courses than has been commonly supposed.

Part of the variation may be due to use of the larger constant, as the courses laid out for validation each had different and unknown SCPF's, if larger constant was always used. This tends to warp things.

To check the effect of use of larger constant, I assumed that it had been used in every layout. I assumed the effect of this was to increase the length of each course by 2.9 meters, which is the difference between the "target" 10,010 m and the median measured value of 10012.9 m.

The little chart below shows how I have reckoned the effect of the larger constant. The "As validated" column shows the way the courses actually came out, near the target of 10,000. The "Less 2.9" column shows what these courses would have validated to if average constant had been used. The "Less 12.9" column shows things with neither larger constant nor 1.001. I have assumed that the 5 m/10 km allowance for error in the validation measurement exists in all cases.

	As validated	Less 2.9	Less 12.9	
1	9919.4	9916.5	9906.5	
2	9919.4	9916.5	9906.5	
3	9919.4	9916.5	9906.5	
4	9941.1	9938.2	9928.2	
5	9958.4	9955.5	9945.5	
6	9969.5	9966.6	9956.6	
7	9975.0	9972.1	9962.1	
8	9977.4	9974.5	9964.5	
9	9978.4	9975.5	9965.5	
10	9985.9	9983.0	9973.0	
11	9986.6	9983.7	9973.7	
12	9989.8	9986.9	9976.9	
13	9992.8	9989.9	9979.9	
14	9993.2	9990.3	9980.3	
15	9994.1	9991.2	9981.2	
16	9995.6	9992.7	9982.7	pass level using larger constant. 15 courses fail
17	9995.7	9992.8	9982.8	
18	9997.2	9994.3	9984.3	
19	9997.5	9994.6	9984.6	
20	9997.8	9994.9	9984.9	
21	9999.7	9996.8	9986.8	pass level using average constant. 20 courses fail.
22	10000.1	9997.2	9987.2	
23	10000.5	9997.6	9987.6	
24	10000.7	9997.8	9987.8	
25	10000.8	9997.9	9987.9	
26	10001.2	9998.3	9988.3	
27	10001.6	9998.7	9988.7	
28	10002.7	9999.8	9989.8	
29	10002.8		9989.9	
30	10003.9		9991.0	
31	10004.1		9991.2	
32	10004.1		9991.2	
33	10004.1		9991.2	
34	10004.5		9991.6	
35	10004.7		9991.8	
36	10005.0		9992.1	
37	10005.6		9992.7	
38	10005.8		9992.9	
39	10006.2		9993.3	
40	10006.2		9993.3	
41	10006.2		9993.3	
42	10006.3		9993.4	
43	10006.8		9993.9	
44	10006.9		9994.0	
45	10007.2		9994.3	
46	10007.7		9994.8	
47	10007.8		9994.9	
48	10007.8		9994.9	
49	10008.1		9995.2	pass level with no 1.001 or larger constant. 48 courses fail.
50	10008.5		9995.6	
51	10008.6		9995.7	

EFFECTS OF SAFETY FACTORS

Total courses validated = 153

	Number	Percent
Failures using average constant w/o 1.001=	48	31.4
Failures using average constant and 1.001 =	20	13.1
Failures using larger constant and 1.001 =	15	9.8

SCPF reduced failures from 31 percent to 13 percent.
Larger constant reduced failures from 13 percent to 10 percent.

I haven't got a handle on the degree to which larger constant makes courses "too long" as the SCPF's used in the validations file are unknown. The effect is certain but unknown.

SOLUTION TO JEAN-FRANCOIS DELASALLE'S "BOUCLE DE LIDL" PUZZLE

Measurement of the loop with a curbed turn-around (1.5 m radius) centered at F

C to F	79.63	
Length of semicircle of 1.8 m radius	5.65	1.8 m because of 30 cm offset
F to D	82.11	
D to A	322.50	
A to B	349.70	
B to C	719.49	
Loop length (C to C):	**1559.08**	

The complete course:

B to C	719.49
6 times C to C:	9354.51
C to F:	79.63
Course before final adjustment:	**10153.63**
Need to Shorten by:	153.63

The turnaround is used six times, thus the center of the arc must be moved southwards by 153.63/12, or: 12.80 meters

Submitted Answers:

Bob Langenbach	12.281 meters south of F
Ray Thompson	10.83
Roger Gibbons	11.775
Bernie Conway	12.33

Several noted that the course, with its 6 laps for 10 km, would be a nightmare to administer, with lapped runners confusing things.

PUZZLE OF THE MONTH

Tom Riegel submits: A motorcycle speedway has been built. It has a circuit length of 4 km along the inside line, with semicircular ends. The two straightaways are each 1 km in length. The width of the track is 24 meters. The track is flat, with no banking. Competitors must maintain constant speed with no accelerating or braking.

A 200 km race (50 laps) is to be held on the track. How far will the winner travel in completing the race?

USING REFERENCE POINTS IN COURSE MEASUREMENT

COLUMBUS MARATHON

Summary of Course Measurements

The following route was followed: Broad, Parkview, Maryland, Columbia, Caroline, Drexel, Bryden, Columbia, Powell, Parkview, Main, Holtzman, Bryden, Town, Third, Reinhard, Jaeger, Deshler, High, Dodridge, Ackerman, Kenny, Fishinger, Mt Holyoke, Zollinger, North Star, Lane, Kenny, Woody Hayes, Woodruff, College, 12th, Neil, Buttles, Park, Nationwide Blvd, Finish near arena

	First Measurement			Second Measurement		by SOSS	
	8-May Meters	9-May Meters	16-May Meters	26-May Meters	30-May Meters	Interval Length	Cumulative Length
Even with east curbline High St (Ref Start)							0.0
Even with west curbline of 3rd St		213.2			213.1	213.1	213.1
ECL Champion		2528.9			2528.2	2528.2	2741.3
Center of storm drain on Parkview at Broad St		2366.5			2367.4	2366.5	5107.8
School speed limit sign on Drexel N of Broad		2641.3			2640.9	2640.9	7748.6
Hydrant on Main - 1st one E of Holtzman		3778.7			3777.7	3777.7	11526.3
Lightpole on Town at Third		4733.6			4730.9	4730.9	16257.3
Center of curb drain on Jaeger at Deshler (SE corner of park)		2387.8			2387.7	2387.7	18645.0
Even with south curbline of State St		2638.4			2638.0	2638.0	21282.9
Even with south curbline of Gay St		388.8		389.1		388.8	21671.7
Even with north curbline of Goodale St	1166.0			1165.7		1165.7	22837.4
Lightpole at NE corner of Bollinger (Buttles) & High St	380.1			380.1		380.1	23217.5
Steel Pole S of Dodridge on High (W side, no lamp)	4402.8			4403.7		4402.8	27620.3
Telephone Pole on Dodridge, 1st after High, S side	20.3			20.2		20.2	27640.5
First Hydrant on Kenny after Ackerman	2350.1			2350.1		2350.1	29990.7
Sewer cover in sidewalk on Kenny. First sewer cover S of Fishinger	559.8			559.8		559.8	30550.5
Center of storm drain on Mt Holyoke, first drain E of Trentwood, E side	948.8			949.0		948.8	31499.3
N side of curb drain at N Star and Lane Ave	2162.1			2161.9		2161.9	33661.1
1st lightpole E of Kenny on Woody Hayes (using south lane)	1533.4			1535.6		1533.4	35194.5
1st lightpole S of Woody Hayes on College (W side)	1999.3			1999.3		1999.3	37193.7
Telephone pole on Neil at 8th St	1731.8			1731.0		1731.0	38924.8
Hydrant on Park at Buttles	2139.8			2140.9		2139.8	41064.6
Ref Finish	1054.8			1054.9		1054.8	42119.4
Finish - S edge Nationwide Arena			121.0	121.2		121.0	42240.4

SOSS	42240.4
First	42247.5
Second	42246.4

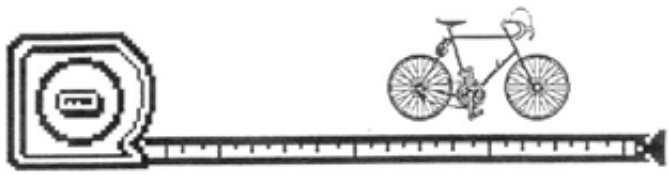
Above is an example of the use of reference points. They are especially handy if you have the luxury of time, and if you suspect that there is a strong probability that you will be measuring the course again. In the example I've used the results of five different measuring occasions to get two complete measurements of all the segments of the course.

Each column is supplemented by another sheet, showing calibrations and measurements performed on that date.

With all the reference distances established, the splits can be laid out with ease. Instead of riding from one end of the course to the other, with the splits gradually creeping away from the proper location, one can restart the split layout at the last reference point before the split in question. Thus, any errors will be small.

Next year when there is another inevitable change of course, it will be necessary only to drop the segments that are no longer included and add in a few new segments to make up the whole.

Measure Up



October 2000 Volume 13 No. 3

Convention Topics

Quick! How do you spell Albuquerque? We'll all learn since both the USATF 2000 and the RRCA 2001 conventions will be held there. USATF gets started on November 29 and concludes December 3 and, as usual, includes the Road Running Technical Council in their two-session talkfest. Topics will include most anything you want to talk about. Most likely to be included:

◆ Validation of the Sydney Marathon course (why so many flats?)

◆ Use of average constant vs. larger constant. So what's the difference?

◆ Adjusting splits: when to do it and what's the best way

◆ Total climb and course profile: Are they worth the effort?

◆ Drop vs. negative drop: what in the world is negative drop?

◆ Chip mat placement. First you find the finish line.

◆ What's your topic?

New Appointment

The Road Running Technical Council is pleased to announce that ***John Ferguson*** (Austin) has been appointed certifier for Louisiana effective June, 2000. He assumes duties from ***Tom McBrayer.***

John's measuring experience goes back over 10 years. He has measured many courses in the Central Texas area, including the major runs in Austin. How many times have you done the Motorola Austin Marathon, John?

So all you Louisiana measurers, send your paperwork to John at 3026 Sesbania; Austin, TX 78748-1912 (512-282-4175).

Refresher Course

How does your map look? Still that nice sharp image that tells the race director — or that total stranger in town — everything they need to know? Here's a check list.

- 1/2" margins on all sides
- North is up!!
- Name of the race and distance
- Name of City
- Mile = M
- Kilometer = km (lower case)
- Meter = m (lower case)
- As always, clean black and white. Remember, *Runner Triathlete News* puts them on the web at www.runnertriathletenews.com

According to USATF and IAAF, international distances on the roads are measured and listed in kilometers. Distances on tracks are in meters. The Olympic marathon, which traditionally starts and finishes on the stadium track, is 42.195 km. Of course, if you are measuring a 5 or 10 miler, kilometer splits are not required.

Splits

◆ By all accounts, Sydney 2000 was one of the best — if not the best — Olympics ever. It's called proper prior performance — organization! Example: **Dave Cundy**, road events manager, and **Hugh Jones**, official measurer of the race walks and the marathon, both were present at Atlanta for the marathon validation. They rode, took notes and pictures, definitely benefiting from the experience. So how many reps from the 2004 Olympics rode with the Syndey validation team? Zero!

Who's Doing What Across the States

◆ **Roger Soler** (San Antonio) is at it again — still. His big hit Texas Marathon Challenge is back for the second year. check it out on rogersoler.com. And he's expanded to three run stores, two Roger Soler's Sports in San Antonio plus a new location in Corpus Christi. Besides all of that, he's race director for the SunMart 50km/50M.

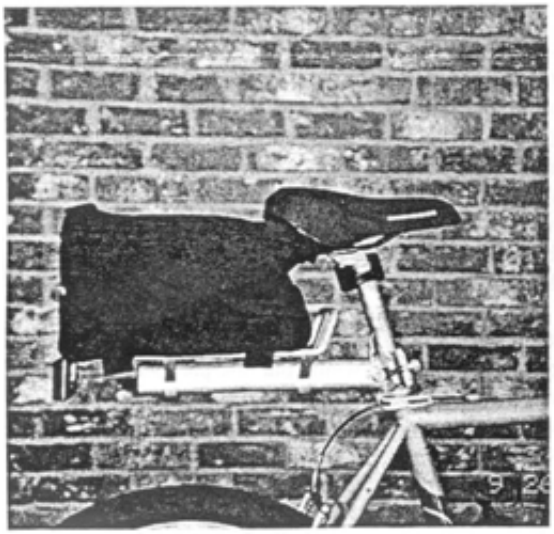
◆ You can say we knew him when .... **Scott Christopher** (LaFayette) has been appointed to the RRCA executive board. He has been Louisiana's state rep since '96. In 1999 he was chosen "outstanding state rep." And he's still measuring.

◆ We don't see them much but they still need to be measured. **Scott Eppelman** (Coppell) is race director for the Ultracentric 24/48 hour track run held in the Dallas area each year. For record keeping purposes, the track must be measured and certified. This ultra event used to be held on the Plano East High School track. Scott moved to the Greenhill School, then discovered he would have to learn how to pull on a tape measure since that track had never been certified. Armed with a 100 meter open reel tape and with the help of a couple of Buddies, Scott submitted a very creditable measurement. Hey, it's at least 400 meters.

◆ Candidate for the course name of the year – the Bastrop Kiwanis Toad Trot 5K." It was measured by **Moe Johnson** (San Marcos).

Blackburn Quick Release Aluminum Rack and Bushwacker Bag

If you're tired of sagging bike bags, try this combo. This is what the police bike patrols use. You won't be carrying radios and handcuffs, but there's plenty of room for tapes, slicker suit, etc. A picture is worth a thousand words and we've included two, pictures that is. That's my trusty fat-tired Diamondback with the new rack and bag mounted. Both items were purchased in Houston. If you'd like to try this combo and can't find them in your locale, contact me and I'll put you in touch with our neighborhood bike shop or try the Nashbar catalog.



Measure Up
Volume 13 No. 3

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Measurement of the Olympic marathon course, Montreal 1976

(The above article appeared in September *Measurement News*. The commentary below did not.)

Commentary & Analysis by RRTC Webmaster, Bob Baumel

The techniques described in the above article by Ron Wallingford differed in various ways from the modern calibrated bicycle method as used now for measuring road courses. The major differences can be summarized as follows:

- The 1976 measurement used a multiple sets of marks methodology, which means that every measurement of both the calibration course and race course was a "layout" measurement that attempted to produce a course of desired distance; thus, every measurement generated new marks on the road. Nowadays, we always use one set of marks, which means that only the first measurement of a course is a "layout" measurement that generates a tentative course and produces marks on the road. Every subsequent measurement generates only numbers depicting estimated values for the length of the tentative course. (Then, after all measurements have been performed, a single adjustment is made to correct the course to the desired distance.) An advantage of one set of marks, aside from less painting of the road, is that differences between measurements are readily apparent from the numerical results of those measurements. When using multiple sets of marks, differences between measurements aren't known until you go back and measure the distances between paint marks on the road. Unfortunately, terms such as "shorter" and "longer" may have opposite meanings when using one-set-of-marks or multiple-sets-of-marks terminology. The 1976 measurers did not share the concern for short course avoidance which has now become part of course measuring philosophy. In several instances, they made choices (e.g., steel tape instead of EDM ["distomat"] for the calibration course, bike measurement instead of survey team measurement for the race course) which had the effect of producing a shorter course for the runners. Now, the rules require us to produce courses which are at least as long as the nominal race distance. Therefore, we always resolve uncertainties by choosing the option that produces the longer final race course.

- The 1976 measurement didn't utilize any Short Course Prevention Factor (SCPF). Nowadays, to help ensure that courses are at least the nominal distance, an SCPF of 1.001 is built into every race course measurement. Thus, although the marathon distance is nominally 42.195 km, we intentionally apply a 1.001 factor which, in effect, lays out the course at 42.237 km; i.e., 42 meters longer than the marathon distance. This isn't really intended to produce long courses. Considering that some error is unavoidable in any measurement, the SCPF helps to avoid short courses in spite of the inevitable errors that always occur when measuring.

- The 1976 course was measured along a path which maintained a clearance of one metre from curbs. Now we measure a tighter path ("Shortest Possible Route") with clearance of only 30 cm from curbs. For more details, see discussion below on Evolution of the SPR Concept.

- The effect of pavement undulations is probably nowhere near as great as assumed by Wallingford in the above article. In laying out their 1 km calibration course, the 1976 measurers obtained a discrepancy of about 9 cm between their average steel tape measurement and their EDM ("distomat") measurement. Our data suggest that pavement undulations probably didn't account for more than 1 or 2 cm of that discrepancy. The remainder of the 9 cm may have been due to random taping errors, calibration error of tape and/or EDM, improper temperature correction, or incorrect tensioning of the tape. Even if the entire 9 cm discrepancy in their 1 km calibration course was due to pavement undulations (which is extremely unlikely), that would extrapolate to only about 4 metres when extended to the full 42.195 km marathon distance. There's no way that pavement undulations could have accounted for the entire 30 m difference between their bike measurement and survey team measurement

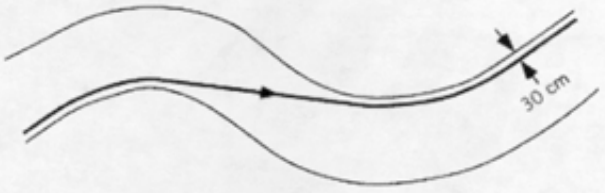
- Although the 30 m difference between bike measurement and survey team measurement cannot be explained by pavement undulations, it was nevertheless quite good agreement (Anything within our one-part-per-thousand SCPF is pretty good). To our knowledge, the 1976 Olympic marathon measurement was the only documented example of a marathon course measured by both calibrated bike and the older, far more laborious methods previously used by professional survey teams. This was the first Olympic marathon course measured by calibrated bicycle and, in this case, the course was measured both ways. We don't have details for the 1980 Moscow Olympic course, but assume that it was measured using only the older survey team method. Starting with the 1984 Los Angeles Olympics, road courses have been measured using only the bicycle method.

Evolution of the Shortest Possible Route (SPR) concept

The choice of path to measure along a road running course has evolved over the years. At the primeval dawn of course measurement, the rule was to measure "one metre from the curb in the running direction" which simply meant to measure parallel to one edge of the road, on the side of the road where runners are intended to run (usually the right side in countries where cars drive on the right; left side in other countries), at clearance of about 1 m from the curb or road edge. There was no measuring of tangent lines. This path is illustrated in the following diagram:

By the time of the 1976 Montreal measurement, this had evolved so measurers were following a path closer to the actual path taken by runners, using tangent lines when measuring between alternating right and left turns. However, a clearance of 1 m was still maintained from curbs and road edges, as illustrated in the following diagram:

Now, we measure the shortest possible route (SPR) that a runner can run. We follow all tangent lines and come to within 0.3 m (i.e., 30 cm or about one foot) of curbs and road edges, as shown in the following diagram:



The 30 cm offset from curbs that we use now for measuring road courses is exactly the same offset as specified in rules for track measurement. Calculations show that for every 90° turn, measurement at 30 cm from the curb (instead of the 1 m clearance used previously) alters the path length by about 1.1 m. The first Olympic marathon course to be measured using a fully modern SPR was the 1984 Los Angeles course, which was measured by a team of 13 cyclists.

The original Wallingford article may be seen on the RRTC web site at: http://www.rrtc.net

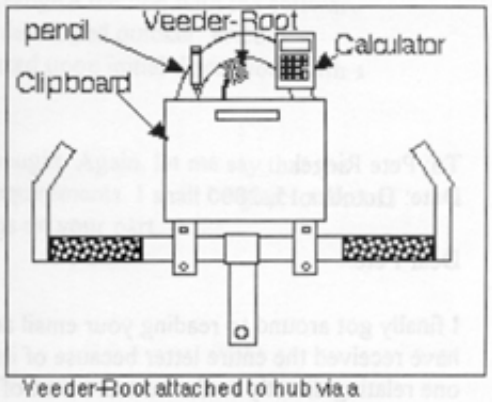
The Columbus Dispatch

Neal C. Lauron / Dispatch

Columbus bicycle coordinator Dale Hooper hopes to fix sewer grates, such as this one on Mound Street near Wheatland Avenue, that could unseat riders.

MADE TO MEASURE

Dear Pete,



Veeder-Root attached to hub via a speedometer cable and mounted on aerobar.

This summer I picked up some bicycle speedometer parts and have been tinkering with a Jones counter that was mounted to my handlebars via a cable. In order to test its accuracy, I have measured about 60 km over seven rides with two Jones counters attached to my front wheel. I didn't achieve the desired goal of identical readings between the two: the average difference between the counters is 0.000033 m/km. The greatest difference was 0.000045 m/km, which would equate to1.899 m for a marathon.

My measurement season is done for the year, but I plan to resume data collection in 2001.

I have also made some modifications to my measuring bike. Some old triathlon clip on bars, a clipboard, 4 zip ties and some Velcro have virtually eliminated the need for pockets (though I won't be cutting them out of my clothes just yet.)

And finally, I purchased a Cateye CC-AT100 cyclecomputer which, in addition to the standard features, includes an altimeter and a thermometer. The altimeter is sensitive to changes in barometric pressure, and I use topographical maps to calibrate it. The thermometer tends to read a degree or two (C.) above the air temperature (possibly because it's encased in black plastic), but is a great indicator of temperature change while riding.

Comparison of Standard Jones Counter and Cable-Mounted Counter

Bent cable, mounted on handlebar			*Distance measured (m.)*
Cable	Standard	Difference	
5998.179	5997.941	0.238	0.00397%
4001.9	4001.783	0.117	0.00292%
9000.705	9000.302	0.403	0.00448%
Slightly bent cable, mounted on aerobar			*Distance measured (m.)*
Cable	Standard	Difference	
6809.43	6809.267	0.163	0.00239%
Straight cable, mounted on aerobar			Distance measured (m.)
Cable	Standard	Difference	
6376.722	6376.985	-0.263	-0.00412%
8113.336	8113.523	-0.187	-0.00230%
Straight cable, mounted on bar end			*Distance measured (m.)*
Cable	Standard	Difference	
20000.909	20000.299	0.610	0.00305%

Best,

Laurent Lacroix

Leonard F. Luchner
FAX: 561-694-3094

To: Pete Riegel
Date: October 15, 2000

Dear Pete:

I finally got around to reading your email and I was a little bit concerned that you may not have received the entire letter because of its longevity. There were two parts to the letter, one relating directly to the measurement of the Sydney marathon course. I won't say any more about that within this letter, hopefully I intend to do so in the near future. And you can fully understand my thinking in relation to improving the method of course measurement and the need to update measurement equipment because of the Sydney situation

First of all, an improvement would include the use of laser beam instruments for measuring calibration courses. In today's market, laser beams are available at less than $50 each for application for distances up to 300 yards. Even by splitting the total measurement distance (greater than 300 yards) the accuracy increases the reliability of the measurement. Laser beams as such can either be available by the individual or by an arrangement by which two or three of the units would be made available for each of the measurement districts.

As for direct course measurement, the currently available electronic computer for bicycles, properly calibrated, can be very effective. Admittedly, there are other conditions which should be considered; data memory, although already existing, to be rearranged for different intervals such as varying kilometer readings with the possibility of a red light being added on the instrument to indicate kilometer distances. It would be worthwhile to also consider an assured system over and above the existing for continuation of power between stops. In the present unit it is limited to four minutes. For calibration purposes an additional two millimeters can be entered into the computer for the SCPF of 1m/km without further concern. This would depend on the wheel diameter. Starting with the current units (approximately $20 US) additional corrections will certainly cost money. These can be readily analyzed by discussions, then handed over to a proper software design consultant. This should not be a very difficult task. Current measurement requirements approximate 1000 races per year, more or less. If each could then be assessed at $10 per race as part of the measurement fee, it would be possible within a period of one year to obtain $10,000 US but which at the same time may not be enough in which case the IAAF might be approached to help.

Realizing, of course, that the majority of the races measured are of distances less than the marathon, it might be necessary to scale the assessment, but at the same time realizing the effectiveness of what it might mean and the efficiency of measurement, it could be possible that the $10 might be assessed for each race, regardless of length.

There is no question in my mind that the project would be successful because most of the basic foundation of the unit already exists. There's no question that it's going to take more than "a few weeks" and it may even be possible to arrange a method with the software designer on a partial payment process so it could be developed quicker. Price consideration, I'm sure, can be more accurately assessed upon initial discussions with a proper individual willing to undertake the proposal.

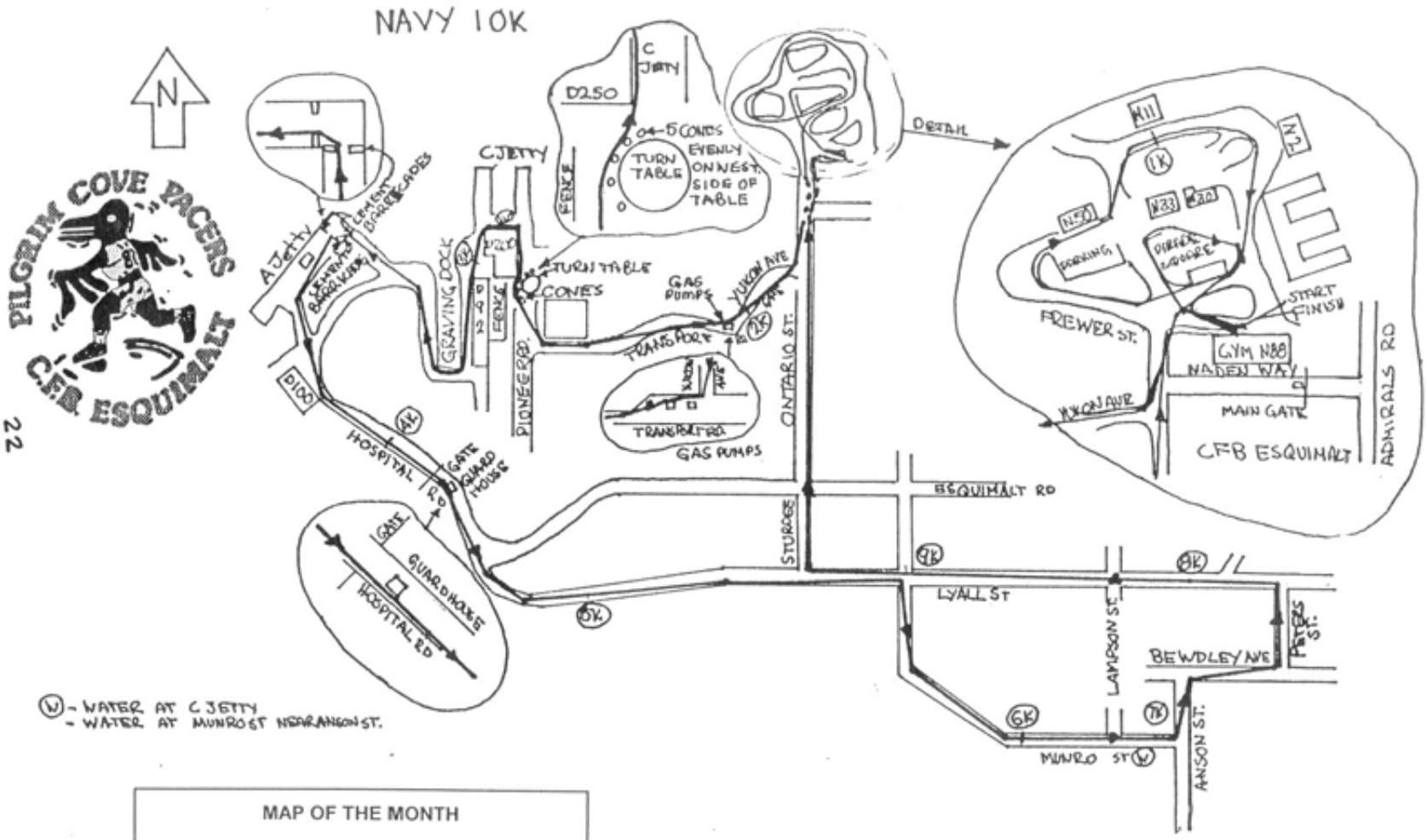
I believe the above pretty much explains my initial thought. Again, let me say that the biggest problem will be for fulfillment of monetary requirements. I shall be glad to discuss the matter further should there be additional questions on your part.

Sincerely,

Len

P.S.- The accuracy of the present bicycle unit is stated at 0.01%. equivalent to the measurement standard.

Len.



NOT TO SCALE

MAP OF THE MONTH

This course, measurement and map by Canadian measurer Ron Mierau, has been submitted for certification to *Run Canada*. The course is located on the Canadian Forces Navy docks at Victoria, BC.